
PROBABILISTIC INTERPRETATION OF PEELLE’S PERTINENT PUZZLE AND ITS RESOLUTION

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The confusion surrounding Peelle’s pertinent puzzle (PPP) arises in part because of its imprecise statement, which leads to a variety of interpretations and resulting answers, some of which seem implausible. For example, in the PPP specification, it is not stated whether the uncertainties contribute to the measurements in an additive or multiplicative manner. This ambiguity leads to vastly different answers, depending on one’s interpretation of the puzzle. In our approach to the PPP problem, we emphasize the importance of basing the analysis on an unambiguous probabilistic model that is consistent with fundamental physical principles. Although the model may be nonlinear and require an iterative solution, its accurate evaluation must yield plausible and justifiable results. We present several contrasting models of how the measurements quoted in the PPP problem could be obtained, and interpret their solution in terms of a detailed probabilistic analysis. We discuss the influence of tacit assumptions that are typically made in data analysis, for example, that of assuming Gaussian distributions for the probability density functions to describe the likelihood of the data.

We conclude by analyzing several data sets that have been used in the past to illustrate the puzzling nature of the answers that can be obtained through application of routine analysis procedures. We show that a precisely-stated model can clarify the approach that needs to be taken to obtain a solution that is consistent with our physical intuition. A suitable approach to analyzing large data sets is described and demonstrated.